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Construction Fatalities in the United States between 2009-2018

Manish Venugopal

Master of Science in Construction & Facilities Management, University of North Carolina at Charlotte

Abstract: *The study focuses on evaluating the construction related deaths in the United States across a 10-year period from 2009-2018. Data was obtained from United States Bureau of Labor Statistics. In-depth analysis was carried on the construction related fatalities to determine the primary cause of death.*

Percentage increase of construction related mortality between two five year periods of 2009 to 2013 and 2014 to 2018 were calculated. In addition, percentage of deaths across construction industry in comparison with the overall mortality in all industries was determined.

Fall from height accounted for 36.76% of fatal incidents and was identified as the major cause of construction related deaths in the United States.

In addition, construction related deaths on an average accounted for approximately 18.17% of fatalities across the United States across the 10-year period from 2009 to 2018.

Keywords: *Construction Fatalities; Safety; Falls; Hazard Recognition*

I. INTRODUCTION

In 2019, United States accounted for 328.5 million people (Bureau, 2020) out of the global population of 7.7 billion people (Max Roser, 2020). Urbanization has led to swift increase in the development of infrastructure across the United States (Foley et al., 2005; Venugopal, 2019).

Result of which has made construction industry one of the fastest growing in the United States. (Bureau of Labor Statistics, 2018) stated that construction industry alone accounted for 4% of the workforce in the United States. However, (Brunette, 2004) stated that 1/5th of the workplace related fatalities was from the construction industry.

The industry accounted for 20.9% of the workplace related fatalities in the United States from 2003 to 2008 (Bureau of Labor Statistics, 2008). In addition, (Albert & Hallowell, 2012) stated in the United States from 1995 to 2008 the construction industry accounted for approximately 1000 deaths every year.

Over the years, the primary causes of construction related fatalities were from falls, slips, or trips from heights such as roof edges, scaffolds, floors, ladders, and lifts (Chi, Chang, & Ting, 2005; Janicak, 1998; Lipscomb, Dement, & Rodriguez-Acosta, 2000; Suruda, 1992).

Followed by struck or crushed by objects or vehicles such as rolling over trucks, machineries, bulldozers, and heavy equipment (Lipscomb et al., 2000; McCann, 2006; Rundmo, 1992). (Venugopal, 2020) also stated that the fall, slips, and trips from heights and struck and crushed by objects alone accounted for 4/5th of deaths in the construction industry in the state of North Carolina in the United states.

Exposure to harmful substances, fires, explosions, violence and electrocutions accounted for the remaining deaths (Dorevitch, Forst, Conroy, & Levy, 2002; Lipscomb et al., 2000; McCann, Hunting, Murawski, Chowdhury, & Welch, 2003; Suruda, 1992; Wang, 1999).

The purpose of this study is to investigate the construction related fatalities in the recent decade from 2009 to 2018. The study will aid in evaluating the primary causes of these fatal incidents and contribute to literature about construction related fatalities in the United States.

II. DATA COLLECTION & METHODS

Data was obtained from U.S. Bureau of Labor Statistics for a 10-year period from 2009 to 2018. Data consisted of fatalities based on various industries & causes across the united states for the 10-year period. Data regarding fatalities related to construction industry was evaluated in depth for the purpose of the study.

Table 1. Causes of Fatalities in Construction Industry from 2009-2018 across the United States

Year	Causes of Fatal Incidents in Construction Industry							Sum
	Violence	Struck by Vehicle	Explosion	Fall	Harmful Substances	Crushed by Object	Other	
2009	41	213	14	283	132	151	-	834
2010	30	188	26	264	126	138	2	774
2011	32	197	11	262	112	122	2	738
2012	35	234	9	290	102	136	-	806
2013	36	223	13	302	111	140	3	828
2014	46	244	14	359	122	114	-	899
2015	32	226	17	364	138	159	1	937
2016	40	246	11	384	140	166	4	991
2017	56	234	15	386	145	133	8	977
2018	61	250	16	338	173	169	1	1,008
Sum	409	2255	146	3232	1301	1428	21	8792
Average	41	226	15	323	130	143	2	879
Percentage	4.65%	25.65%	1.66%	36.76%	14.80%	16.24%	0.24%	100%

Table 1 shows us the summation of total number of fatalities across based on causes were given for each year. From this, the total number of deaths for each individual year and the 10-year period as a whole was calculated. In addition, the average number of deaths based on various causes were determined for each individual year and the 10-year period as a whole.

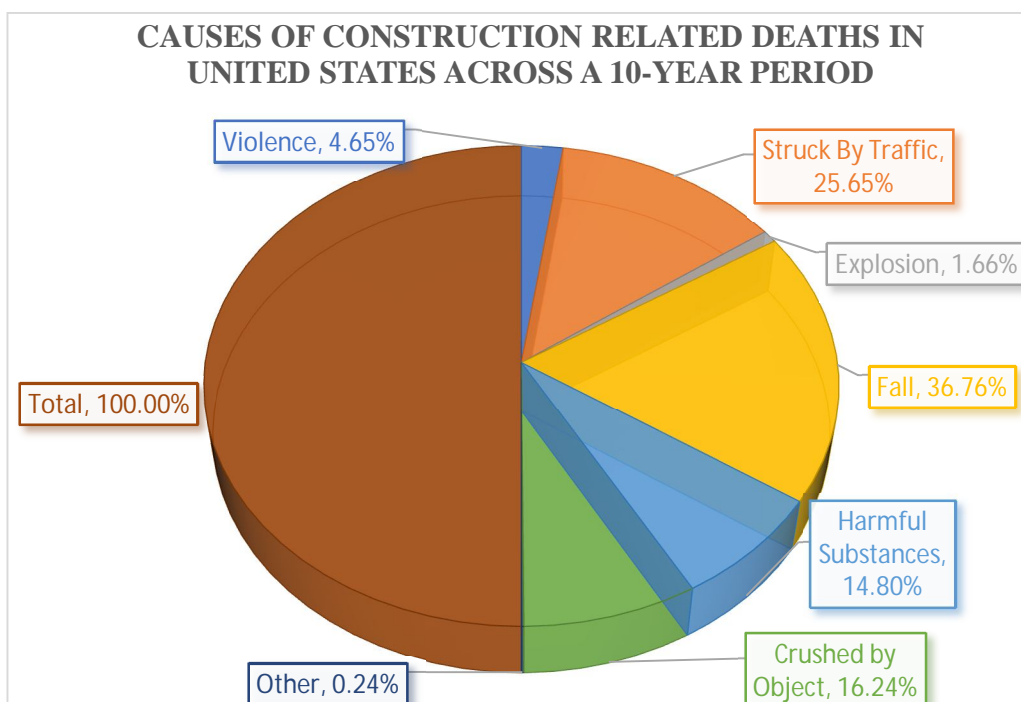


Figure 1. Causes of Construction Related Deaths in United States across 2009-2018

Figure 1 shows us the percentage of fatalities based upon each individual cause in comparison with the total number of deaths across the 10-year period. The percentages were found out by dividing the summation of total number of deaths based on each causes to the total number of deaths as a whole across the 10-year period.

Table 2. Percentage of Deaths in the Construction Industry in Comparison with Total Number of Fatalities across all the industries in the United States from 2009-2018

Year	Construction Industry	All Industries	Percentage
2009	834	4551	18.33%
2010	774	4690	16.50%
2011	738	4693	15.73%
2012	806	4628	17.42%
2013	828	4585	18.06%
2014	899	4821	18.65%
2015	937	4836	19.38%
2016	991	5190	19.09%
2017	977	5147	18.98%
2018	1,008	5250	19.20%
Total	8,792	48391	18.17%



Figure 2. Percentage of Deaths in the Construction Industry in Comparison with Total Number of Fatalities across all the industries in the United States from 2009-2018

Table 2 & figure 2 shows the total number of deaths in the construction industry and all industries as a whole in the United States. Total number of deaths in the construction industry is divided by the total number of deaths in all the industries to determine the percentage of construction related fatalities across the United States across the 10-year period. Similarly, the percentage for each individual year is also calculated.

Table 3. Increase in Construction Related Fatalities Between Two Five-Year Periods

Year	Deaths	Year	Deaths
2009	834	2,014	899
2010	774	2,015	937
2011	738	2,016	991
2012	806	2,017	977
2013	828	2,018	1,008
Sum	3,980	Sum	4,812
Average	796	Average	962
Percentage Increase			17.29%

Table 3 shows the percentage increase in the number of fatalities between when dividing the 10-year period into two five year periods of 2009 to 2013 & 2014 to 2018. Summation and average number of fatalities across the two five periods were calculated. From this, the percentage increase between the two five year periods were determined by subtracting the two averages and dividing by the average number of deaths across the 2014 to 2018.

III. RESULTS & ANALYSIS

- A. Table 1 and figure 1 depicts that fall, trip, slip from heights is the primary cause of construction fatalities in the United States. From 2009 to 2018, 3,232 people died in the construction industry due to falls. On an average, 323 people died, and this accounted for 36.76% of deaths in the industry. It was also evident that the second major cause was struck by objects which accounted for a total of 2255 (25.65%) fatalities in the industry across the 10-year period. 1,428 (16.24%) deaths out of 8,792 deaths across the 10-year period were caused by crushed by object, with an additional 1,301 (14.80%) deaths accounted from exposure to harmful substances. The least amount of fatalities was from violence and explosion which accounted for 409 (4.65%) and 146 (1.66%) of deaths respectively. Other unknown factors caused 21 deaths in the construction industry.
- B. From table 2 and figure 2, shows that there were 48,391 deaths across various industries in the United States not limited to agriculture, mining, construction, manufacturing, services, retail, transportation, information, finance, real estate, educational, leisure & hospitality industries. There was a staggering 8,792 deaths across the 10-year period from 2009 to 2018 in the construction industry alone. This indicates almost 1/5th of the total fatalities were from the construction related activities.
- C. From table 3, it was also evident that the number of deaths in the construction industry had increased in the last five years in comparison to previous five years. There was a 17.29% increase in the amount of fatalities in the construction industry from 2014 to 2018 in comparison with 2009 to 2013. The number of deaths increased from 3,980 to 4,812 in the same period of time.

IV. CONCLUSION

For decades the primary causes of deaths in the industry were fall, struck by objects, crushed by objects. In the recent decade, fall from height alone accounted for more than 1/3rd of the construction related deaths. It was followed closely by struck by objects which accounted for 1/4th of the fatalities. In addition, crushed by objects also was a major cause accounting for more than 1/6th of the construction related fatalities. These results indicated the major causes of construction related fatalities haven't changed in the recent times.

The results also depicted that the number of deaths in the industry has increased 17.29% from 2014 to 2018 in comparison to 2009 to 2013. In addition, construction industry alone accounts for 18.17% of fatalities in the United States in comparison to other industries. In United States researchers have been more focused on hazard recognition and construction fatalities in the recent decades.

Construction organizations have already mandated the usage of personal protective equipment for the construction workers. They have also implemented the usage of fall protection devices for construction workers to negate the potential threat of falling from heights.

In addition, they have also made it mandatory to conduct safety meetings and trainings. Despite of this the results indicated that construction related fatalities haven't reduced. Moving forward, the industry should start using virtual & augmented reality based devices which will help in potentially identifying the hazards beforehand. This technology will be able to curtail the number of construction related fatalities in the near future.

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